

MOVABLE WALL SYSTEM

FIELD OF THE INVENTION

The present invention relates to movable walls, and in particular the present invention relates to a wall that raises and lowers vertically.

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BACKGROUND TO THE INVENTION

In certain situations, it is desirable to extend the outdoor environment into a building. This is generally accomplished by opening a window or opening a patio door. However, in many situations the limited opening provided by a window or a patio door is
10 insufficient for an individual's or business' needs, and a more substantial opening is desired.

In the case of a restaurant, patios are popular in the summer. The patio environment is generally extended into the restaurant through the use of sliding or folding doors. These doors however have a number of disadvantages.

15 Sliding doors typically slide so that one portion of the door is in front of a second portion. This leaves a large panel that obscures the outer environment. Because waiters need access to the patio, patrons are placed in front of these panels and the experience of the outdoor environment is diminished.

Alternatively, sliding doors fit within a pocket in a wall. The pocket may need to
20 project into a space to accommodate the sliding door, and may further leave a gap for the folding door at the entrance to the pocket when the pocket is not being used.

With folding doors, the doors generally fold into large panels that rotate into the building and onto the patio. The panels are typically large because when closed it is desirable to have large windows in the building. The extension of these folded panels
25 into the building and onto the patio provides an unsightly obstruction.

Vertical openings have in the past been created for uses such as garage doors. However, the use of a garage door mechanism is undesirable for walls. Garage doors employ either hinged panels to allow the door to slide around a track, or a single door that is pivoted up and slid horizontally along a track. Neither is useful for a wall. Hinged
30 panels are not aesthetically pleasing in a wall. The use of a pivoting and sliding mechanism is impractical due to the weight of a wall.

SUMMARY OF THE INVENTION

The present invention overcomes the disadvantages of the prior art by providing a wall that can be raised or lowered vertically. The wall is not pivoted and does not contain
5 hinged panels. Due to the vertical lifting, the obstructions of horizontal sliding walls are eliminated.

The present invention employs two screws, one on each side of the movable wall. These screws are rotated through a single motor to ensure the rotation at each side of the wall is uniform and that the wall is thereby raised evenly.

10 The movable includes brackets on either side of it, the brackets having a threaded portion adapted to engage the screws. The wall thereby moves up and down through the rotation of the screws.

A limiting mechanism, such as a contact switch or a timer, is used to stop the motor when the wall has reached the most vertical point or when the wall has been
15 completely closed.

The present invention therefore provides a movable wall comprising: a panel; a first bracket connected to a first side of said panel; a second bracket connected to a second side of said panel; a first screw, said first screw being located on said first side of said panel and engaging said first bracket, whereby rotation of said first screw causes said
20 first bracket to raise or lower; a second screw, said second screw being located on said second side of said panel and engaging said second bracket, whereby rotation of said second screw causes said second bracket to raise or lower; a motor; a shaft, said shaft being rotatable by said motor; a first gearbox being connected to said shaft and adapted to change the direction of rotation of said shaft, said first gearbox further being connected to
25 said first screw; and a second gearbox being connected to said shaft and adapted to change the direction of rotation of said shaft, said second gearbox further being connected to said second screw, wherein rotation of said shaft rotates said first screw and said second screw at an equal rate of rotation, thereby raising or lowering said panel.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood with reference to the following drawings, in which:

5 Figure 1 is a front elevational, partial cross-sectional view of the movable wall of the present invention;

Figure 2 is a plan, cross sectional view of the movable wall of Figure 1;

Figure 3 is a side elevational, cross sectional view of the movable wall of Figure 1, where the cross section is within the movable wall;

10 Figure 4 is a side elevational, cross-sectional view of the movable wall of Figure 1, where the cross section is along a screw of the movable wall;

Figure 5 is a magnified view of the bottom of the movable wall of Figure 3;

Figure 6 is a magnified view of the wall mount of Figure 2;

Figure 7 is a side elevational, cross sectional view of a cross beam of the movable wall of the present invention; and

15 Figure 8 is a side elevational, cross sectional view of the gearbox and screw of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

Reference is now made to the drawings.

20 Figure 1 illustrates a preferred embodiment of the movable wall 10 of the present invention. Movable wall 10 consists of a movable panel 12, which in the preferred embodiment includes glass panels 14 and a frame 16.

Movable panel 12, in the preferred embodiment, moves from a bottom or closed position, as illustrated in Figure 1, to a raised position. In a raised position, panel 12 rests
25 against an upper support 18 and within a pocket 20.

A bracket 22 is affixed on either side and near the bottom of panel 12. Bracket 22 comprises a lifting top plate 24, two side plates 26, and a ball screw 28. Side plates 26 are affixed to frame 16 of movable panel 12. Top plate 24 is affixed to the top of side plates 26 and is further preferably attached to frame 16. As one skilled in the art will
30 realize, frame 16, top plate 24 and side plates 26 are preferably made of steel, and are welded together. Other materials are however possible.

As best seen in Figure 6, top plate 24 includes a hole 30 created within top plate 24. A screw 32 fits within hole 30. Ball screw 28 is affixed below top plate 24 and fits about screw 32. An inner thread within ball screw 28 is adapted to engage screw 32, whereby rotation of screw 32 causes ball screw 28 to move up or down, depending on the direction of rotation of screw 32. Moving ball screw 28 further causes top plate 24 and the entire bracket 22 to move up or down, thereby moving panel 12.

As best seen in Figure 7, screw 32 is rotatably connected to the building at its upper end using a top bearing 34, which is held to a column using a spacer plate 36. Screw 32 is thereby restricted from moving laterally, but is allowed to rotate.

Reference is now made to Figure 8. At its lower end, screw 32 is placed within a hole in a steel plate 38. Screw 32 is further placed through a thrust bearing 40. The combination of steel plate 38 and thrust bearing 40 ensures that screw 32 cannot move laterally but is allowed to rotate.

As will be realized by those skilled in the art, screws 32 must rotate at the same time and at the same rate of rotation in order to raise or lower panel 12. If one screw rotates at a different rate from the other screw, one side of panel 12 will raise or lower at a different rate than the other side of panel 12, causing bracket 22 to seize on screw 32 and potentially causing damage to the system.

Numerous methods exist to ensure that screws 32 rotate at the same rate. In the preferred embodiment of the present invention this is accomplished by using only one motor 46 for both screws 32. Motor 46 rotates a shaft 48 that extends to both sides of panel 12.

Gearboxes 50 transfer the rotational energy of shaft 48 by 90 degrees, thereby turning screw 32. 90-degree gearboxes are known to those skilled in the art.

Shaft 48 further requires cross rod supports 52 to ensure that a large span of shaft 48 does not remain unsupported. The number of cross rod supports 52 required will be determined by the width of panel 12.

A further feature of one embodiment of the present invention is a support beam 60 used to support the portion of the structure above the opening for panel 12. Support beam 60 ensures the structural integrity of the wall above the opening for panel 12.

In order to provide weather sealing, an embodiment of the present invention further includes a pocket 62 into which panel 12 fits when in a closed position. Pocket 62 ensures that panel 12 does not move in the wind, and further creates a barrier to seal water out from the structure. The top of panel 12 is provided with a weather strip 64 and
5 an insulating felt strip 66 to provide both insulation and weatherproofing.

In operation, the movable wall is moved from a closed position to an open position through the activation of a switch. The switch turns on motor 46, which is used to rotate shaft 48. Shaft 48 then uses gearboxes 50 to change the direction of rotation by 90 degrees and to rotate both screws 32. The rotation of screws 32 further causes ball
10 screws 28 to raise along screws 32, thereby raising brackets 22 and panel 12.

The present invention further includes a limiter for limiting the lifting of panel 12. In a preferred embodiment the limiter includes a contact switch located within pocket 20 to indicate that the panel has been raised to its maximum position. Other limiters could include timers to time the duration of lifting or closing, or a torsion monitor on motor 46
15 to indicate when motor 46 is unable to raise the wall further. These limiters stop motor 46.

Similar limiting mechanisms can be used to limit the closing of the door, which is accomplished by turning motor 46 in the opposite direction, thereby rotating screws 32 in the opposite direction.

20 The above is meant to be illustrative of the present invention and is not meant to limit the invention. One skilled in the art will realize that variations are possible. The present invention is only limited by the following claims.